

REMARKS

As an initial matter, Applicants note that the Examiner suggests that the title of the invention is not descriptive and should be amended to reflect that the invention is directed toward a method. In response, Applicants direct the Examiner's attention to Applicants' preliminary amendment filed with the present Application, wherein the title of the invention was amended to read "METHOD OF COATING CUTTING TOOLS".

Applicants further note that in the preliminary amendment, the specification was also amended to contain specific reference to the prior-filed, non-provisional applications to which benefit is claimed, as required by 37 C.F.R. §1.78(a)(2)(i) and (iii). Although the Examiner indicates in the current Office Action that the preliminary amendment canceling claims 1-19 was entered, Applicants respectfully request that the Examiner enter the remainder of the preliminary amendment as contained in the prior filed paper.

Applicants herein further amend the specific reference to prior-filed, non-provisional applications added by preliminary amendment to reflect the issuance of U.S. Patent 6,447,890 on Application Serial No. 09/467936, filed December 21, 1999. Further, in accordance with the Examiner's suggestion, the Abstract of the Disclosure is replaced herein with language reflecting that the claims in the present Application are directed to a method. As suggested in 68 Fed.Reg. 38,616 (June 30, 2003), Applicants provide a clean copy of the abstract on a separate sheet of paper accompanied by instructions to cancel the previous version of the abstract, and do not include a marked-up version of the abstract. No new matter is added to the Application by these amendments. Accordingly, Applicants request that the Examiner enter the amendments as presented.

Claim 20 is amended herein to more particularly point out features of certain embodiments of the present invention. Applicants assert no new matter is added by this amendment and respectfully request that the Examiner enter the amendment.

New claims 23-35 are added to the Application. No new matter is added. Support for these claims can be found throughout the Application, for example, at pages 3-5 and 14-24 of the specification. Applicants request that the Examiner enter new claims 23-35.

Rejections Under 35 U.S.C. §112

At page 3 of the Office Action, the Examiner rejects claims 20-22 as being indefinite for failing to particularly point out and distinctly claim the subject matter which Applicants regard as the invention. Specifically, the Examiner states that in claim 22, "the term 'intermediate said first coating and said second coating' is confusing as to what it means." In particular, the Examiner questions how the application of a third coating can be intermediate two coatings.

Applicants respectfully submit that claim 22 is not indefinite. As discussed at page 6, lines 1-7 of the Application:

[d]esignations such as "first", "second", and "third" are used herein to identify individual coatings or layers only and, in the present description and the attached claims, *do not necessarily refer to the ordering of the layers or coatings or their sequence of application on the substrate.* Thus, for example, a "first" coating or layer is not necessarily in contact with or immediately adjacent a "second" coating or layer, and a "third" coating or layer, as well as additional coatings or layers, may be deposited intermediate the "first" and "second" coatings or layers.

(Emphasis added).

Accordingly, Applicants assert claim 22 is not indefinite and respectfully request that the Examiner withdraw his rejection of claim 22 under §112, second paragraph.

With respect to claims 20 and 21, Applicants do not believe the Examiner intended to reject these claims as being indefinite. For example, neither claim 20 nor claim 21 refer to a "third layer." Although the Applicants believe that claims 20 and 21 are not indefinite, if the Examiner should maintain his rejection of claims 20 and 21 under §112, second paragraph, Applicants respectfully request that the Examiner provide an explanation of the perceived deficiency in the claims so that Applicants can appropriately respond.

Rejections Under 35 U.S.C. §102(e)

At pages 3 and 4 of the Office Action, the Examiner rejects claims 20-22 under 35 U.S.C. §102(e) as being anticipated by U.S. Patent 5,958,569 to Leverenz et al. ("Leverenz"). The Examiner states that Leverenz "discloses a method of coating a

cutting tool insert with two intermediate layers between a substrate and an outer aluminum oxide surface coating with the intermediate layers being a metal nitride, a metal carbide, or a metal carbonitride (col. 2 lines 19-32). The metal can be hafnium." Further, the Examiner states that "[t]he appropriate thicknesses are taught in col. 2 lines 18-32."

Applicants respectfully submit that claims 20-22 are not anticipated by the Leverenz.

As discussed in the M.P.E.P, "for anticipation under 35 U.S.C. 102, the reference must teach every aspect of the claimed invention either explicitly or impliedly." M.P.E.P §706.02 at page 700-21 (Rev. 1, Feb. 2003).

Leverenz discloses a cutting tool having two intermediate coatings between a metal substrate and an aluminum oxide surface coating wherein "[t]he coating adjacent the substrate is a 1 to 4 micron layer of *titanium nitride*." Leverenz at col. 2, lines 22-23 (emphasis added). Further, Leverenz states that "[t]he coating over the titanium nitride layer is a 2 to 4 micron thick *titanium carbonitride layer*...". Leverenz at col. 2, lines 23-25 (emphasis added). Leverenz further states that "[t]itanium is not the only suitable metal for use in the *carbonitride coating*. The metal may be comprised of ...zirconium, hafnium...". Leverenz at col. 2, lines 33-36 (emphasis added).

Accordingly, Leverenz discloses a cutting tool with a *titanium nitride layer adjacent a substrate* and a carbonitride layer over the titanium nitride layer, and further teaches that the *carbonitride layer* can be formed from metals such as zirconium and hafnium.

Claim 20 recites, in pertinent part, "applying a first coating of at least 2 microns to at least a portion of the substrate, the first coating comprising at least one of a metal carbide, a metal nitride, and a metal carbonitride of a metal selected from the group consisting of *zirconium and hafnium*." As discussed above, Leverenz discloses that the coating adjacent the substrate is a *titanium nitride* layer. Further, Leverenz only discloses that the carbonitride layer (i.e., the layer over the titanium nitride layer) can be formed from metals other than titanium, such as zirconium and hafnium. Accordingly, Leverenz does not teach, either explicitly or impliedly, this limitation of claim 20.

Additionally, as discussed above, Leverenz teaches a cutting tool with a titanium nitride layer over coated by a *metal carbonitride layer*. However, as mentioned above, claim 20 recites, in part, applying a first coating of at least 2 microns to at least a portion of the substrate, the first coating comprising at least one of a metal carbide, a metal nitride, and a metal carbonitride of a metal selected from the group consisting of zirconium and hafnium; and applying a second coating, said second coating comprising at least one of a metal *nitride* and a metal *oxide* of a metal selected from groups IIIA, IVB, VB, and VIB of the periodic table. Thus, Leverenz also does not expressly or impliedly disclose this limitation of claim 20.

Since anticipation requires that each and every element of the claim be found, expressly or impliedly, in a single reference, and since Leverenz does not disclose each and every element of claim 20, Leverenz does not anticipate claim 20. Further, since claims 21 and 22 depend from claim 20, at least for the reasons set forth above with respect to claim 20, Leverenz also does not anticipate these claims.

Although Applicants make no representation herein as to whether Leverenz is prior art against the present Application under 35 U.S.C. §103(a), Applicants further submit that Leverenz does not teach or suggest all of the limitations of claim 20, and therefore does not render claim 20 obvious. Leverenz does not teach or suggest a method of making a cutting tool insert including a hard substrate and a plurality of coatings, the method comprising applying a first coating of at least 2 microns to at least a portion of the substrate, the first coating comprising at least one of a metal carbide, a metal nitride, and a metal carbonitride of a metal selected from the group consisting of *zirconium and hafnium*. As discussed above, Leverenz teaches a cutting tool insert with a titanium nitride coating adjacent the substrate of the cutting tool and further teaches that a titanium carbonitride layer is coated over the titanium nitride layer. Leverenz then specifically teaches that the *carbonitride* layer can be formed from a metal such as zirconium or hafnium. Thus, there is no teaching or suggestion in Leverenz that the layer adjacent the substrate can be formed from any metal other than titanium. Further, as discussed above, Leverenz does not teach or suggest a second coating comprising at least one of a metal *nitride* and a metal *oxide* of a metal selected from groups IIIA,

IVB, VB, and VIB of the periodic table. Accordingly, Applicants assert that claim 20, and the associated dependent claims 21 and 22, are patentable over Leverenz.

In view of the foregoing, Applicants respectfully request that the Examiner reconsider and withdraw his rejection of claims 20-22 under 35 U.S.C. §102(e), and allow these claims. Nevertheless, if the Examiner maintains his §102(e) rejection of claims 20-22 on the basis that the inventions claimed in the Application are disclosed in Leverenz, then it directly follows that Leverenz cannot be prior art against the Application under §102(e).

As previously noted, the present Application is a divisional of Application Serial Number 09/467936 filed December 21, 1999, now U.S. Patent 6,447,890, which is a continuation-in-part of Application Serial Number 09/390570 filed September 3, 1999, now abandoned, which is a continuation of 08/860163, which is the National Stage of International Application Number PCT/US96/17107, filed October 23, 1996 (now U.S. Patent 5,958,569). Applicants have previously amended the first paragraph of the specification as required under 35 U.S.C. §120 and 37 C.F.R. §1.78(a) to include a specific reference to the prior applications from which benefit is claimed. Accordingly, the effective filing date of the claims in the Application that are disclosed in Leverenz is *October 23, 1996*.

As noted by the Examiner, the pre-AIPA version of §102(e) is applicable to Leverenz, which is a U.S. patent resulting directly from an international application filed before November 29, 2000. Under the provisions of the pre-AIPA version of 35 U.S.C. §102(e), the effective date of Leverenz is the date on which requirements of §371(c)(1), (2), and (4) were met. As indicated on the face of Leverenz, this date is apparently June 16, 1997. Accordingly, at least for the reason that the §102(e) date of the Leverenz reference (i.e., June 16, 1997) is not October 23, 1996 under the applicable provisions of 35 U.S.C. §102(e), Leverenz does not constitute prior art against the claims of the Application that recite inventions disclosed in Leverenz.

In sum, the Applicants conclude that the invention of claim 20 is not disclosed by Leverenz. However, if the Examiner concludes otherwise, then it follows that Leverenz is not prior art to the claim under §102(e). Accordingly, Applicants respectfully request

that the Examiner withdraw his rejection of claims 20-22 as being anticipated by Leverenz et al. under §102(e) and allow the claims.

Rejections under 35 U.S.C. §103(a)

At page 5 of the Office Action, the Examiner rejects claims 20-22 under 35 U.S.C. §103(a) as being unpatentable over Cho et al. (U.S. Patent 4,830,886, hereinafter "Cho") or Bryant et al. (U.S. Patent 5,750,247, hereinafter "Bryant"). According to the Examiner, Cho discloses "coating cemented carbide cutting tools... for example by coating with an intermediate layer of hafnium nitride, carbide or carbonitride followed by additional layers of titanium carbide by CVD, PVD, sputtering, etc." Additionally, the Examiner asserts "Bryant discloses a method of coating a cemented carbide substrate with two layers including an inner layer of hafnium carbide and outer layer of chromium carbide." While the Examiner states that both Cho and Bryant are silent on the coating thickness, the Examiner asserts that determination of optimum coating thickness would be within the skill of one practicing in the art.

As discussed in the M.P.E.P., "[t]o establish *prima facie* obviousness of a claimed invention, all the claim limitations must be taught or suggested by the prior art." (M.P.E.P. §2143.03).

With respect to the Examiner's rejection of claim 20 under 35 U.S.C. §103(a) as being unpatentable over Cho, Applicants respectfully assert that Cho does not teach or suggest all of the claim limitations of amended claim 20. As disclosed in Cho, "[i]n accordance with the present invention, there is provided process [sic] for making a cemented carbide cutting insert of the type comprising a substrate of tungsten carbide grains in a cobalt matrix having *a layer of titanium carbide directly adjacent the substrate.*" Cho at col. 2, lines 19-23 (emphasis added). Further, at col. 2, lines 23-25 Cho states that "[t]he *substrate directly adjacent the layer of titanium carbide comprises tungsten carbide* in a form chemically unreacted with cobalt." Thus, Cho clearly teaches a substrate having a titanium carbide layer *directly adjacent* the cutting tool insert.

Although the term "intermediate coatings" is used at col. 6, line 15 of the Cho reference, when read in the context of the entire disclosure, it is apparent that the

"intermediate coating" refers to a coating that is applied on the *titanium carbide coated substrate*. In particular, Cho states:

[t]he *titanium carbide coated substrate body produced by the methods of the examples given above may be coated with additional layers of refractory material by chemical vapor deposition techniques or physical vapor deposition techniques known in the art. For example, the preferred intermediate coatings of titanium nitride, titanium carbonitride, hafnium nitride, hafnium carbide or hafnium carbonitride and alumina, or even additional layers of titanium carbide are applied by chemical vapor deposition techniques....*

Cho at col. 6, lines 10-22 (emphasis added). Further, Cho states "[a]s an example, titanium nitride intermediate coating layers and outer coating layers are formed *on the titanium carbide coated substrate or on the intermediate coating layers* of cutting tools of this invention...." Cho at col. 6, lines 30-33. Thus, a titanium nitride layer can be formed on the titanium carbide coated substrate or on another intermediate layer formed on the titanium carbide coated substrate.

Amended claim 20 recites, in pertinent part, "a method of making a cutting tool insert including a hard substrate and a plurality of coatings, the method comprising applying a first coating of at least 2 microns *to at least a portion of the substrate*, the first coating comprising at least one of a metal carbide, a metal nitride, and a metal carbonitride of a metal selected from the group consisting of *zirconium and hafnium*." Since Cho does not teach or suggest forming a coating of at least one of a carbide, nitride, or carbonitride of a metal selected from zirconium and hafnium on *at least a portion of the substrate*, Cho does not disclose every limitation of claim 20. Accordingly, Applicants respectfully submit that claim 20 is patentable over Cho and request that the Examiner reconsider and allow claim 20, and the associated dependent claims 21 and 22.

Further, although Applicants do not acquiesce to the Examiner's reading of Cho, even if Cho were read as suggested by the Examiner, Applicants respectfully assert that Cho still does not disclose all of the elements of amended claim 20.

According to the Examiner, "Cho discloses coating cemented carbide cutting tools...by coating with an intermediate layer of hafnium nitride, carbide or carbonitride

followed by additional layers of titanium carbide...." See Office Action at page 5 (emphasis added). However, claim 20, as amended, recites, in pertinent part, "...applying a first coating of at least 2 microns to at least a portion of the substrate, the first coating comprising at least one of a metal carbide, a metal nitride, and a metal carbonitride selected from the group consisting of zirconium and hafnium; and applying a second coating, said second coating comprising at least one of a metal *nitride* and a metal *oxide* of a metal selected from groups IIIA, IVB, VB, VIB of the periodic table."

Since Cho does not teach or suggest coating a cutting tool insert with a first coating of at least one of a carbide, nitride, or carbonitride of a metal selected from zirconium or hafnium and a second coating of a *nitride* or an *oxide* of a metal selected from groups IIIA, IVB, VB, VIB of the periodic table as required by amended claim 20, Applicants respectfully submit that claim 20 is patentable over Cho and request that the Examiner reconsider and allow claim 20, and its associated dependent claims 21 and 22.

With respect to the Examiner's rejection of claims 20 under 35 U.S.C. §103(a) as being unpatentable over Bryant, Applicants respectfully assert that Bryant does not teach or suggest all of the limitations of amended claim 20. At col. 2, lines 63-67, Bryant discloses a cemented carbide substrate with two layers. An inner layer selected from titanium carbide, tantalum carbide, vanadium carbide, zirconium carbide, hafnium carbide, and niobium carbide; and an *outer layer selected from tungsten carbide, molybdenum carbide, and chromium carbide.*

However, as indicated above, amended claim 20 recites a method of making a cutting tool insert including a hard substrate and a plurality of coatings, the method comprising applying a first coating of at least 2 microns to at least a portion of the substrate, the first coating comprising at least one of a metal carbide, a metal nitride, and a metal carbonitride of a metal selected from the group consisting of zirconium and hafnium; and applying a second coating, said second coating comprising at least one of a metal *nitride* and a metal *oxide* of a metal selected from groups IIIA, IVB, VB, and VIB of the periodic table.

As discussed above, the cemented carbide substrate taught by Bryant has an inner layer selected from titanium carbide, tantalum carbide, vanadium carbide,

zirconium carbide, hafnium carbide, and niobium carbide; and an outer layer selected from tungsten *carbide*, molybdenum *carbide*, and chromium *carbide*. Therefore, Bryant does not teach or suggest a second coating comprising at least one of a metal *nitride* and a metal *oxide* of a metal selected from groups IIIA, IVB, VB, and VIB of the periodic table as recited in claim 20. Accordingly, Applicants respectfully submit that claim 20 is patentable over Bryant and request that the Examiner reconsider and allow claim 20, and its associated dependent claims 21 and 22.

New Claims:

Claims 23-25

New claims 23-35 have been added herein. Claims 23-25 depend, either directly or indirectly, from claim 20. For the reasons discussed above, Applicants assert claim 20 is patentable over the cited references. Accordingly, Applicants assert new claims 23-25 are also patentable and request that the Examiner allow claims 23-25.

Claims 26-29

New claim 26 recites a method of making a cutting tool insert including a hard substrate and a plurality of coatings, the method comprising applying a first coating comprising hafnium nitride to at least a portion of the substrate, said first coating having a thickness ranging from 2 to 5 microns; applying a second coating comprising aluminum oxide, said second coating having a thickness ranging from 1 to 10 microns; and applying a third coating comprising titanium carbonitride, said third coating having a thickness ranging from 2 to 6 microns.

As previously discussed with respect to claim 20, Leverenz discloses a cutting tool insert with at *titanium nitride* layer adjacent the cutting tool substrate. However, new claim 26 recites, in pertinent part, a method of making a cutting tool insert comprising applying a first coating comprising *hafnium nitride to at least a portion of the substrate*. Accordingly, since Leverenz does not teach or suggest this limitation of claim 25, Applicants submit that Leverenz does not render new claim 26 unpatentable.

Further, as previously discussed with respect to claim 20, Cho discloses forming a *titanium carbide layer directly adjacent a cutting tool*. However, new claim 26 recites,

in pertinent part, a method of making a cutting tool insert comprising applying a first coating comprising *hafnium nitride to at least a portion of the substrate*. Since Cho does not teach or suggest this limitation of claim 26, Applicants submit that Cho does not render new claim 26 unpatentable.

Again, even under the Examiner's reading of Cho, Cho does not teach or suggest all of the limitation of claim 26. Specifically, Cho does not teach or suggest coating a cutting tool insert with a first coating comprising hafnium nitride, a second coating comprising aluminum oxide, and a third coating comprising titanium carbonitride.

Still further, as previously discussed with respect to claim 20, Bryant discloses a cemented carbide substrate having an inner layer selected from titanium *carbide*, tantalum *carbide*, vanadium *carbide*, zirconium *carbide*, hafnium *carbide*, and niobium *carbide*; and an outer layer selected from tungsten *carbide*, molybdenum *carbide*, and chromium *carbide*. Thus, Bryant does not teach or suggest a method of making a cutting tool insert comprising applying a first coating comprising hafnium *nitride* to at least a portion of the substrate. Additionally, according to the Examiner, Bryant discloses a method of coating a cemented carbide substrate with *two* layers. Accordingly, Bryant does not teach or suggest the method of claim 26, which recites a method comprising applying first, second, and third coatings to a cutting tool insert.

Therefore, Applicants submit that new claim 26 is patentable over Leverenz, Cho and Bryant, alone or in combination. Further, because new claims 27-29 depend, either directly or indirectly, from claim 26, Applicants submit that these claims are also patentable over the cited reference. Accordingly, Applicants respectfully request that claims 26-29 be allowed by the Examiner.

Claims 30-35

New claim 30 recites a method of making a cutting tool insert including a hard substrate and a plurality of coatings, the method comprising depositing an inner layer on at least a portion of the substrate, the inner layer comprising at least one of a metal carbide, a metal nitride, and a metal carbonitride of a metal selected from the group consisting of zirconium and hafnium; depositing a reinforcing layer adjacent the inner

layer, the reinforcing layer comprising a metal carbonitride having a nitrogen to carbon atomic ratio between 0.7 and 0.95 as determined by x-ray diffraction and wherein the reinforcing layer comprises a plurality of projections; and depositing a wear-resistant layer adjacent the reinforcing layer, the wear-resistant layer comprising a ceramic, wherein the plurality of projections of the reinforcing layer project into the wear-resistant layer.

Applicants assert that new claim 30 is patentable over Leverenz and Cho for the reason set forth above with respect to claim 20. Specifically, neither Leverenz nor Cho teach or suggest coating the substrate of a cutting tool by *depositing an inner layer on at least a portion of the substrate*, the inner layer comprising at least one of a metal carbide, a metal nitride, and a metal carbonitride of a metal selected from the group consisting of *zirconium and hafnium*. Further, neither Cho nor Bryant teach or suggest a method of making a cutting tool insert comprising depositing a reinforcing layer adjacent the inner layer, the reinforcing layer comprising a metal carbonitride having a nitrogen to carbon atomic ratio between 0.7 and 0.95 as determined by x-ray diffraction and wherein the reinforcing layer comprises a plurality of projections.

Accordingly Applicants respectfully submit that new claim 30 is patentable over the reference cited by the Examiner, either alone or in combination, and request that the Examiner allow new claim 30. Further, at least for the reasons discussed above with respect to claim 30, Applicants request that new claims 31-35, which depend, either directly or indirectly from claim 30, be allowed.

Obviousness-Type Double Patenting Rejection:

At pages 5 and 6 of the Office Action, the Examiner rejects claims 20-22 under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claim 10 of U.S. Patent 5,958,569. Pursuant this rejection, Applicants submit the attached Terminal Disclaimer under 37 C.F.R. §1.312(c) and fee required under 37 C.F.R. §1.20(d). A statement under 37 C.F.R. §3.73(b) is also submitted herewith.

Applicants further enclose herewith copies of the assignment of the present Application from the inventors to ATI Properties, Inc., and from ATI Properties, Inc., to

TDY Industries, Inc., the current owner of the Application. Applicants note that the assignment of the Application from ATI Properties, Inc. to TDY Industries, Inc. was executed prior to execution of the Terminal Disclaimer in the Application.

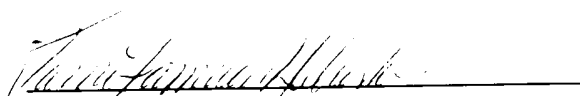
An assignment of the invention of U.S. Patent 5,958,569 from the inventors to Teledyne Industries, Inc. was previously recorded in the USPTO. A copy of this original assignment document is also enclosed. Applicants further submit herewith a certified copy of the Certificate of Amendment of Articles of Incorporation of Teledyne Industries, Inc., which reflects the name change of Teledyne Industries, Inc. to TDY Industries, Inc.

As is evident from these documents, U.S. Patent 5,958,569 and the present Application are commonly owned by TDY Industries, Inc. Therefore, in view of the submission of the Terminal Disclaimer in the Application, Applicants respectfully request that the Examiner withdraw the obviousness-type double patenting rejection in the present Application.

CONCLUSION

For the forgoing reasons, Applicants respectfully request that the Examiner reconsider and allow claims 20-22. Applicants also request that the Examiner consider and allow new claims 23 -35. Applicants request that the Examiner call the undersigned to discuss any additional questions or concerns with respect to the above-referenced patent application.

Respectfully submitted,



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ABSTRACT OF THE DISCLOSURE

Methods of coating cutting tool inserts including a hard substrate and a plurality of coatings are disclosed. In one embodiment, the method comprises applying a first coating of at least 2 microns to at least a portion of the hard substrate and applying a second coating. The first coating can comprise at least one of a metal carbide, a metal nitride, and a metal carbonitride of at least one metal selected from zirconium and hafnium. The second coating can comprise at least one of a metal carbide, a metal boride, a metal nitride, and a metal oxide of a metal selected from groups IIIA, IVB, VB, and VIB of the periodic table. Optionally, third and fourth coatings are also applied to the cutting tool inserts.